Correspondence: *In gello* imaging

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Physical phantoms are test objects designed to replicate certain imaging characteristics of human tissues and organs, and are used for performance testing of imaging techniques [1]. Phantoms are made with either liquids, elastomers, plastics, resins or gels, or combinations thereof [2]. These base media are given specific additives so that they mimic the interaction properties of tissues with the energy beam of the imaging method used, such as x rays or ultrasound waves. Phantoms incorporate embedded structures that possess object contrast with respect to the embedding medium, and serve as the imaging targets. These can be on the one hand, simple structures such as sub-resolution or larger spheres, crossing wires etc. Imaging these basic phantoms to retrieve the structures can be used to assess the technical specifications of the imaging instrument, such as spatial, contrast, and temporal resolutions, imaging depth, as well as bias and precision. Measuring and monitoring these technical parameters are key for acceptance testing, accreditation, and quality control of standard-of-care imaging equipment.

On the other hand, and more often in the recent past, the embedded structures and/or the phantom *in toto*, can be such as to simulate specific morphological and physiological or functional aspects of tissues for the imaging method [3]. This is done so as to produce imaging features related to living tissues such as vasculature, lesions, flow, perfusion, oxygen saturation and motion in both health and disease. For example Dantuma *et al* [4] developed a functional breast phantom for a photoacoustic-ultrasound breast tomography system. This phantom uses a layered arrangement of polyvinyl chloride plastisol (PVC-P) gels, each with appropriate additives, to mimic fatty tissue and fibroglandular tissue for both photoacoustics and ultrasound. Importantly, the phantom also has embedded a tumor-mimic and wall-less channels, some passing through the tumor. Bovine blood at a controlled oxygen saturation level is circulated through the channels. These features of the breast surrogate enable comprehensive laboratory studies, allowing for testing and refinement of the technology in recovering tumor mass, tumor boundary, tumor-associated vascularization and blood oxygen saturation, well before human studies. Measurements on such advanced phantoms [3] are pivotal for the assessment and iterative optimization of new imaging modalities, to ensure high chances of future success in the clinical setting.

The importance of phantoms, whether basic or advanced, is rapidly gaining acknowledgement for their crucial roles in research, development and standardization of next-generation imaging technologies [3]. Nevertheless, the field of biomedical imaging conspicuously lacks a concise term to convey the idea of acquiring imaging data from phantoms. This absence prompts the need for an addition to the well-established Latin terms used to describe imaging experiments.

The existing Latin terms [5]—such as *in vivo* (Latin for “within the living”), *ex vivo* (Latin for “out of the living”), *in vitro* (Latin for “in glass”) — categorize experimental contexts for imaging. Various other Latin phrases, such as *in situ*, *in utero*, *in planta* and *in ovo* imaging are also used to further distinguish experimental settings in which imaging and microscopy are conducted. We also have *in silico* (pseudo-Latin for "in silicon", instead of the true *in silicium*, refers to silicon that makes processor chips possible) which is used to describe computer simulations using software models. However, none of these terms describes the context of imaging on physical phantoms.

Therefore, we introduce the term *in gello*, coined from gels which are popular materials used for making phantoms. While a gel is difficult to precisely define, it is readily recognizable as such. A possible description is that a gel is a soft, solid or solid-like material comprising a continuous 3D solid skeleton enclosing a continuous liquid phase [6]. Gels closely mimic the mechanical and acoustic properties of soft tissues, possess a realistic tactile experience and deformation behavior, and can be created conveniently to have uniform properties. Although gels have their limitations, including dehydration and aging concerns, they have great potential, particularly with the advent of 3D bioprinting [8]. Gel printing could enable precise layer-by-layer deposition to fabricate anatomically and physiologically accurate 3D phantoms, replicating the size, shape, and internal complexity of organs or tissues.

The word gel is shortened from gelatin rooted in the Latin *gelo* (to freeze or congeal) [7]. Our term *in gello* is inspired from the Latin, but is not an actual Latin phrase. We have chosen it since its pronunciation "dʒɛɬoʊ" reinforces the phonetic connection to gel (while being a playful reference to “Jello”) and preferable to dʒeɪɬoʊ from the true Latin *gelo*. We believe that *in gello* imaging clearly conveys the idea of performing imaging on a phantom, drawing on our intuitive understanding of the gel's similarity to soft tissue. The term may not be inclusive to the diversity of available phantom materials for different imaging modalities and tissue types [2], but as noted earlier, gels are highly versatile and common materials for many phantoms.

In conclusion, *in gello* imaging emerges as a familiar-sounding and appropriate pseudo-Latin shortform that unambiguously conveys the experimental setting of phantom imaging, while acknowledging the present capabilities and future potential of gels in phantom creation. We believe that *in gello* has a useful place in biomedical imaging literature and encourage its use.

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